PB-240 512

SIX MILE LAKE, ST. LOUIS COUNTY, MINNESOTA

Pacific Northwest Environmental Research Laboratory

Prepared for:

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Minnesota Pollution Control Agency
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December 1974

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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I

REPORT
ON
SIX MILE LAKE
ST. LOUIS COUNTY
MINNESOTA
EPA REGION V
WORKING PAPER No. 126

WITH THE COOPERATION OF THE
MINNESOTA POLLUTION CONTROL AGENCY
AND THE
MINNESOTA NATIONAL GUARD

DECEMBER, 1974

II

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Minnesota Pollution Control Agency for professional involvement and to the Minnesota National Guard for conducting the tributary sampling phase of the Survey.

Grant J. Merritt, Director of the Minnesota Pollution Control Agency, John F. McGuire, Chief, and Joel G. Schilling, Biologist, of the Section of Surface and Groundwater, Division of Water Quality, provided invaluable lake documentation and counsel during the course of the Survey; and the staff of the Section of Municipal Works, Division of Water Quality, were most helpful in identifying point sources and soliciting municipal participation in the Survey.

Major General Chester J. Moeglein, the Adjutant General of Minnesota, and Project Officer Major Adrian Beltrand, who directed the volunteer efforts of the Minnesota National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

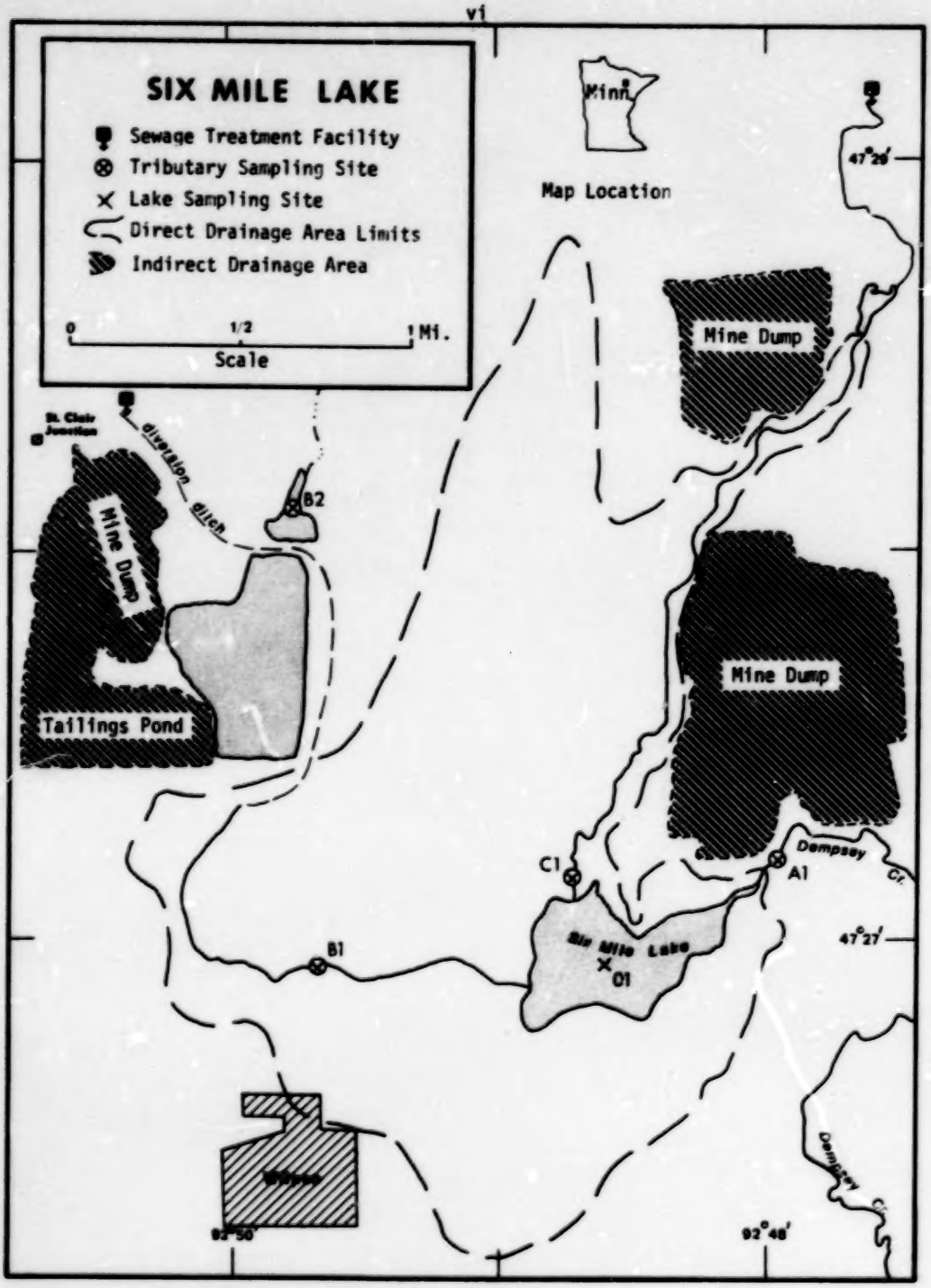
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF MINNESOTA

LAKE NAME	COUNTY
Albert Lea	Freeborn
Andrusia	Beltrami
Badger	Polk
Bartlett	Koochiching
Bear	Freeborn
Bemidji	Beltrami
Big	Stearns
Big Stone	Big Stone, MN; Roberts, Grant, SD
Birch	Cass
Blackduck	Beltrami
Blackhoof	Crow Wing
Budd	Martin
Buffalo	Wright
Calhoun	Hennepin
Carlos	Douglas
Carrigan	Wright
Cass	Beltrami, Cass
Clearwater	Wright, Stearns
Cokato	Wright
Cranberry	Crow Wing
Darling	Douglas
Elbow	St. Louis
Embarass	St. Louis
Fall	Lake
Forest	Washington
Green	Kandiyohi
Gull	Cass
Heron	Jackson
Leech	Cass
Le Homme Dieu	Douglas
Lily	Blue Earth
Little	Grant
Lost	St. Louis

LAKE NAME	COUNTY
Madison	Blue Earth
Malmedal	Pope
Mashkenode	St. Louis
McQuade	St. Louis
Minnetonka	Hennepin
Minnewaska	Pope
Mud	Itasca
Nest	Kandiyohi
Pelican	St. Louis
Pepin	Goodhue, Wabasha, MN; Pierce, Pepin, WI
Rabbit	Crow Wing
Sakatah	Le Sueur
Shagawa	St. Louis
Silver	McLeod
Six Mile	St. Louis
Spring	Washington, Dakota
St. Croix	Washington, MN; St. Croix, Pierce, WI
St. Louis Bay	St. Louis, MN; Douglas, WI
Superior Bay	St. Louis, MN; Douglas, WI
Swan	Itasca
Trace	Todd
Trout	Itasca
Wagonga	Kandiyohi
Wallmark	Chisago
White Bear	Washington
Winona	Douglas
Wolf	Beltrami, Hubbard
Woodcock	Kandiyohi
Zumbro	Olmstead, Wabasha


SIX MILE LAKE
Sewage Treatment Facility
Tributary Sampling Site
Lake Sampling Site
Direct Drainage Area Limits
Indirect Drainage Area
0
1/2
1 Mi.
Scale
Minn.
Map Location
47°28'
Mine Dump
St. Clair Junction
diversion ditch
B2
Mine Dump
Tailings Pond
Mine Dump
C1
A1
Dempsey Cr.
47°27'
B1
Six Mile Lake
01
Dempsey Cr.
92°50'
92°48'

/

SIX MILE LAKE

STORET NO. 2783

I. CONCLUSIONS

A. Trophic Condition:

Survey data show that Six Mile Lake is eutrophic. Of the 80 Minnesota lakes sampled in 1972, 46 had less mean total phosphorus and mean dissolved phosphorus, all had greater mean inorganic nitrogen (Six Mile Lake is known to have abundant macrophytes), 38 lakes had less mean chlorophyll a , and 41 had greater Secchi disc transparency.

B. Rate-Limiting Nutrient:

An algal assay sample was not collected at Six Mile Lake. However, the level of nutrients observed in Six Mile Lake indicates that the potential primary productivity was high.

The lake data indicate nitrogen limitation at both sampling times.

c. Nutrient Controllability:

1. Point sources--The villages of Buhl and Fraser account for almost 89% of the mean annual phosphorus load reaching Six Mile Lake.

The present loading rate of phosphorus, 5.08 $g/m^2/yr$, is six times that proposed by Vollenweider (in press) as "dangerous"; i.e., a eutrophic rate (see page 11). With complete phosphorus

removal at the two point sources, the rate would be reduced to 5.1 lbs/acre/year or 0.57 $g/m^2/yr$. This would be a mesotrophic loading rate and should result in improvement of the trophic condition of Six Mile Lake.

2. Non-point sources--The mean annual phosphorus contribution from non-point sources was estimated to be 11.1%. The gaged tributaries were estimated to contribute 10% while the ungaged drainage areas were estimated to contribute less than 1%.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry†:

1. Surface area: 84 acres.
2. Mean depth: 6.3 feet.
3. Maximum depth: 14 feet.
4. Volume: 529 acre/feet.
5. Mean hydraulic retention time: 36 days.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area*	Mean flow*
Unnamed Stream (B-1)	7.4 mi^2	3.8 cfs
Unnamed Stream (C-1)	6.3 mi^2	3.2 cfs
Minor tributaries & immediate drainage -	1.0 mi^2	0.5 cfs
Totals	14.7 mi^2	7.5 cfs

2. Outlet -

Dempsey Creek	14.8 mi^2**	7.5 cfs

C. Precipitation***:

1. Year of sampling: 28.0 inches.
2. Mean annual: 26.9 inches.

---

† DNR lake survey map (1968); mean depth by random-dot method.
* Drainage areas are accurate within ±5%; mean daily flows are accurate within ±10%; and ungaged flows are accurate within ±10 to 25% for drainage areas greater than 10 mi^2.
** Includes area of lake.
*** See Working Paper No. 1, "Survey Methods".

III. LAKE WATER QUALITY SUMMARY

Six Mile Lake was sampled twice during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two depths at the single station on the lake (see map, page vi). During each visit, a depth-integrated (near bottom to surface) sample was collected for phytoplankton identification and enumeration, and a similar sample was collected for chlorophyll a analysis. The maximum depth sampled was 9 feet.

The results obtained are presented in full in Appendix B, and the data are summarized below.

A. Physical and chemical characteristics:

Parameter	Mean Values 1st Sample (07/08/72)	2nd Sample (09/09/72)
Temperature (Cent.)	19.6	15.4
Dissolved oxygen (mg/l)	5.1	11.6
Conductivity (µmhos)	305	320
pH (units)	7.6	8.9
Alkalinity (mg/l)	117	131
Total P (mg/l)	0.336	0.155
Dissolved P (mg/l)	0.247	0.103
NO_2 + NO_3 (mg/l)	0.040	0.055
Ammonia (mg/l)	0.040	0.065
Chlorophyll a (µg/l)	12.4	29.5
Secchi disc (inches)	38	36

Parameter	Min. for all samples	Max. for all samples	Mean for all samples
Temperature	15.4	20.4	18.2
Dissolved oxygen	2.2	11.6	7.3
Conductivity	290	320	313
pH	6.2	9.0	8.2
Alkalinity	110	132	124
Total P	0.130	0.384	0.246
Dissolved P	0.099	0.301	0.175
$NO_2 + NO_3$	0.040	0.070	0.047
Ammonia	0.030	0.070	0.052
Chlorophyll a	12.4	29.5	20.9
Secchi disc	36	38	37

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
07/08/72	1. Cyclotella	8,855
	2. Cryptomonas	1,446
	3. Microcystis	723
	4. Cocconeis	663
	5. Kirchneriella	542
	Other genera	3,072
	Total	15,301
09/09/72	1. Anabaena	4,262
	2. Stephanodiscus	1,698
	3. Cryptomonas	1,321
	4. Flagellates	1,094
	5. Dinobryon	755
	Other genera	1,034
	Total	10,164

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
07/08/72	01	12.4
09/09/72	01	29.5

C. Limiting Nutrient Study:

Six Mile Lake was not sampled in the fall of 1972. Consequently, an algal assay sample was not obtained. However, the level of nutrients in Six Mile Lake indicates that the potential primary productivity was high.

The lake data indicate nitrogen limitation at both sampling times; N/P ratios were about 1/1, and nitrogen limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the Minnesota National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page vi), except for the high runoff months of April and May when two samples were collected. Sampling was begun in October, 1972, and was completed in September, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Minnesota District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated by using the means of the nutrient loads, in $lbs/mi^2/yr$, in Leech Lake tributaries at stations C-1, D-1, F-1, G-1, H-1, and J-1 and multiplying the means by the ZZ area in mi^2.

The villages of Buhl and Fraser did not participate in the Survey, and nutrient loads were estimated at 2.5 lbs P and 7.5 lbs N/capita/year.

The measured nutrient loads at stations B-1 and C-1 were less than the estimated wastewater treatment plant loads. Therefore, nutrient loads were estimated in the same way as the ZZ loads. The full nutrient loads

* See Working Paper No. 1.

from Buhl and Fraser wastewater treatment plants were assumed to have reached the lake during the sampling year.

A. Waste Sources:

1. Known municipal* -

Name	Pop. Served	Treatment	Mean Flow (mgd)	Receiving Water
Buhl	1,303	trickling filter	0.130**	Buhl Creek to Swan River
Fraser	48	primary	0.005**	Creek to Six Mile Lake

2. Known industrial - None

* Anonymous, 1974.
** Estimated at 100 gal/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
Unnamed Stream (B-1)	210	5.5
Unnamed Stream (C-1)	180	4.7
b. Minor tributaries & immediate drainage (non-point load) -	30	0.8
c. Known municipal STP's -		
Buhl	3,260	85.6
Fraser	120	3.1
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	10	0.3
Total	3,810	100.0

2. Outputs -

Lake outlet - Dempsey Creek 1,690

3. Net annual P accumulation - 2,120 pounds

* See Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
Unnamed Stream (B-1)	9,260	31.6
Unnamed Stream (C-1)	7,880	26.9
b. Minor tributaries & immediate drainage (non-point load) -	1,250	4.3
c. Known municipal STP's -		
Buhl	9,770	33.3
Fraser	360	1.2
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	810	2.7
Total	29,330	100.0

2. Outputs -

Lake outlet - Dempsey Creek 33,640

3. Net annual N loss - 4,310 pounds

* See Working Paper No. 1.

D. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving waters would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	45.4	25.2	349.2	loss*
grams/m^2/yr	5.08	2.83	39.1	-

Vollenweider loading rates for phosphorus ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Six Mile Lake:

"Dangerous" (eutrophic rate)	0.84
"Permissible" (oligotrophic rate)	0.42

* There was an apparent loss of nitrogen during the sampling year. This may have been due to nitrogen fixation in the lake, solubilization of previously sedimented nitrogen, recharge with nitrogen-rich ground water, unknown and unsampled point sources discharging directly to the lake, or underestimation of the nitrogen loads from the villages of Buhl and Fraser. Whatever the cause, a similar nitrogen loss has occurred at Shagawa Lake, Minnesota, which has been intensively studied by EPA's National Eutrophication Research and Lake Restoration Branch.

V. LITERATURE REVIEWED

Anonymous, 1974. Wastewater disposal facilities inventory. MPCA, Minneapolis.

Miller, Richard D., and C. A. Johannas, 1960. Report on follow-up investigation of Six Mile Lake and tributaries, Stuntz Township St. Louis County. MN Dept. of Health, Minneapolis.

Schilling, Joel, 1974. Personal communication (lake map). MPCA, Minneapolis.

Vollenweider, Richard A., (in press). Input-output models. Schweiz A. Hydrol.

VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR MINNESOTA 10/30/74

LAKE CODE 2783 SIXMILE LAKE

TOTAL DRAINAGE AREA OF LAKE 14.40

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
2783A1	14.40	0.43	0.39	1.49	36.81	18.75	10.25	8.00	2.25	3.20	4.64	3.02	0.72	7.49
2783B1	7.41	0.21	0.19	0.71	18.30	9.75	5.30	4.20	1.19	1.78	2.50	1.50	0.38	3.84
2783C1	6.31	0.18	0.15	0.71	15.40	7.95	4.52	3.41	0.89	1.40	1.84	1.15	0.30	3.16
2783Z2	1.68	0.02	0.01	0.11	2.37	1.23	0.79	0.54	0.12	0.23	0.24	0.13	0.04	0.49

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 14.89 TOTAL FLOW IN = 89.82
SUM OF SUB-DRAINAGE AREAS = 14.80 TOTAL FLOW OUT = 89.95

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2783A1	10	72	2.96	15	2.90				
	11	72	1.55	16	1.50				
	12	72	0.48	18	0.50				
	1	73	0.36	14	0.30				
	2	73	0.48	18	0.40				
	3	73	3.27	16	5.60				
	4	73	8.29	6	4.60	24	16.00		
	5	73	14.40	6	13.00	21	5.30		
	6	73	7.44	18	8.80				
	7	73	3.68	17	2.20				
	8	73	4.42	21	6.80				
	9	73	1.96	14	1.60				
2783B1	10	72	1.56	15	1.50				
	11	72	0.79	16	0.80				
	12	72	0.25	18	0.20				
	1	73	0.17	14	0.20				
	2	73	0.19	18	0.20				
	3	73	1.52	16	2.60				
	4	73	4.03	6	2.20	24	8.00		
	5	73	7.41	6	6.40	21	2.70		
	6	73	3.76	18	4.40				
	7	73	1.85	17	1.10				
	8	73	2.28	21	3.50				
	9	73	1.05	14	0.44				

TRIBUTARY FLOW INFORMATION FOR MINNESOTA 10/30/74

LAKE CODE 2783 SIXMILE LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2783C1	10	72	1.15	15	1.10				
	11	72	0.58	16	0.60				
	12	72	0.20	18	0.20				
	1	73	0.15	14	0.10				
	2	73	0.15	18	0.10				
	3	73	1.52	16	2.60				
	4	73	3.39	6	1.90	24	6.70		
	5	73	4.04	6	5.20	21	2.20		
	6	73	3.21	18	3.80				
	7	73	1.50	17	0.92				
	8	73	1.71	21	2.60				
	9	73	0.83	14	0.66				
2783Z7	10	72	0.15	15	0.20				
	11	72	0.06	16	0.06				
	12	72	0.02	18	0.02				
	1	73	0.02	14	0.02				
	2	73	0.01	18	0.01				
	3	73	0.24	16	0.40				
	4	73	0.52	6	0.30	24	1.00		
	5	73	0.93	6	0.80	21	0.30		
	6	73	0.56	18	0.70				
	7	73	0.24	17	0.15				
	8	73	0.23	21	0.35				
	9	73	0.14	14	0.11				

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/10/30

278301
47 26 55.0 092 48 37.0
SIXMILE LAKE
27 MINNESOTA

11EPALES
3

2111202
0009 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/07/08	12 20	0000	20.4	8.0	38	290	9.00	110	0.040	0.030	0.289	0.194
	12 20	0009	18.8	2.2		320	6.20	123	0.040	0.050	0.384	0.301
72/09/09	13 30	0000			36	320	8.90	130	0.040	0.060	0.181	0.108
	13 30	0005	15.4	11.6		320	8.90	132	0.070	0.070	0.130	0.099

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/07/08	12 20	0000	12.4J
72/09/09	13 30	0000	29.5J

J VALUE KNOWN TO BE IN ERROR

APPENDIX C

TRIBUTARY DATA

STORET RETRIEVAL DATE 74/10/30

2783A1 LS2783A1
47 27 30.0 092 48 00.0
DEMPSEY CREEK
27 7.5 HUHL
O/SIAMILE LAKE
CO HWY 642 NE 6 MILE LAKE 2.5 MI SSW BHL
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/10/15	09	00	0.058	0.800	0.072	0.013	0.060
72/11/16	13	00	0.072	0.900	0.031	0.005K	0.031
73/04/06	09	25	0.018	3.100	0.044	0.028	0.140
73/04/24	08	25	0.017	2.900	0.075	0.015	0.105
73/05/06	18	45	0.019	2.200	0.068	0.023	0.050
73/05/21	18	25	0.046	3.150	0.080	0.058	0.085
73/06/18	09	20	0.048	0.860	0.052	0.110	0.150
73/07/17	19	20	0.138	2.000	0.050	0.115	0.175
73/08/21	19	20	0.220	4.300	0.170	0.252	0.280
73/09/14	19	20	0.210	3.200	0.210	0.160	0.200

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K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/30

278381 LS278381
47 27 00.0 092 49 30.0
UNNAMED TRIB TO 6 MILE LAKE
27 7.5 HUML
I/SIXMILE LAKE
ST HWY 5 BRDG .5 MI N OF WILPEN
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO3+NO2 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/10/1[illegible]	08	30	0.420	0.300	0.105	0.005K	0.019
72/11/14	12	40	0.610	0.440	0.076	0.005K	0.021
73/04/06	09	10	0.230	2.200	0.110	0.006	0.040
73/04/24	08	05	0.064	1.800	0.066	0.005K	0.040
73/05/06	19	30	0.035	3.000	0.069	0.022	0.100
73/05/21	18	10	0.013	0.580	0.024	0.012	0.020
73/06/19	09	10	0.056	0.850	0.044	0.022	0.075
73/07/17	19	10	0.048	0.660	0.030	0.011	0.050
73/08/21	19	10	0.093	0.660	0.072	0.012	0.045
73/09/14	19	10	0.066	3.900	0.110	0.019	0.045

K VALUE KNOWN TO BE LESS THAN INDICATED

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STORET RETRIEVAL DATE 74/10/30

278382 LS2783H2
47 28 00.0 092 50 00.0
UNNAMED TRIB W SIDE 6 MILE LAKE
27 7.5 RUHL
T/SIXMILE LAKE
XING E ST CLAIRE JCT/W CO HWYS JCT BLSTP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	01610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/10/15	08	15	0.790	0.350	0.105	0.005K	0.013
72/11/16	12	30	0.510	0.630	0.154	0.015	0.037
73/04/06	09	00	0.270	1.800	0.110	0.015	
73/04/24	07	55	0.641	3.450	0.168	0.007	0.045
73/05/06	18	20	0.033	2.940	0.088	0.019	0.035
73/05/21	19	00	0.023	0.900	0.063	0.020	0.060
73/06/19	09	00	0.038	0.840	0.065	0.025	0.085
73/07/17	19	00	0.065	1.760	0.140	0.066	0.110
73/08/21	19	00	0.027	1.300	0.074	0.022	0.055
73/09/14	19	00	0.031	2.730	0.135	0.017	0.055

K VALUE KNOWN TO BE LESS THAN INDICATED

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STORET RETRIEVAL DATE 74/10/30

2783C1 LS2783C1
47 27 00.0 092 48 30.0
UNNAMED STREM SW BUHL TO 6 MILE
27 7.5 BUHL
T/SIXMILE LAKE
CO HWY 642 XING N 6MILE LK BELW BUHL STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/10/15	08	45	1.050	0.200	0.054	0.013	0.044
73/04/05	09	20	0.920	2.100	0.200	0.092	0.220
73/04/24	08	15	0.450	3.050	0.077	0.090	0.180
73/05/06	18	40	0.440	3.000	0.630	0.126	0.180
73/05/21	18	20	0.010K	0.540	0.022	0.250	0.315
73/06/18	09	15	0.460	3.570	0.180	0.410	0.575
73/07/17	19	15	0.310	1.800	0.063	0.200	0.240
73/08/21	19	15	1.040	1.290	0.063	0.132	0.175
73/09/14	19	15	1.450	3.800	0.132	0.210	0.280

K VALUE KNOWN TO BE LESS THAN INDICATED

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